

REMARKS

The specification has been reviewed, and clerical errors of the specification have been amended.

In the Action, claims 1-20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Shinmei et al. in view of Benoncourt et al.

In view of the rejection, claims 1-3, 5-12, 14-18 and 20 have been amended to clarify the features of the invention, and new claims 21-22 have been added.

As clearly recited in amended claim 1, the present invention relates to a method of operating an electrodeionization apparatus which includes an anolyte compartment having an anode, a catholyte compartment having a cathode, at least one concentrating compartment containing at least one of ion-exchanger, activated carbon and electric conductor, and at least one desalting compartment containing ion-exchanger. The concentrating compartment and the desalting compartment are formed between the anolyte compartment and the catholyte compartment by arranging at least one anion-exchange membrane and at least one cation-exchange membrane.

The method includes supplying electrode water into the anolyte compartment and the catholyte compartment; feeding raw water into the desalting compartment through an inlet thereof so that deionized water flows out from the desalting compartment through an outlet thereof; and supplying a part of the deionized water into the concentrating compartment from a side adjacent to the outlet of the desalting compartment and ejecting the part of the deionized water as concentrated water from the concentrating compartment from a side adjacent the inlet of the desalting compartment so that the part of the deionized water introduced in the concentrating compartment flows in a direction opposite to the raw water flowing through the desalting compartment. Further, at least a part of the concentrated water flowing out of the concentrating compartment is discharged out of a circulatory system.

In particular, the raw water is supplied into the desalting compartment, and flows out of the desalting compartment as the deionized water. A part of the deionized water obtained from the desalting compartment is supplied into the concentrating

compartment, and flows through the concentrating compartment in a direction opposite to the raw water flowing through the desalting compartment. The part of the deionized water is discharged from the concentrating compartment as the concentrated water.

In the invention, since the concentration of silica and boron at the concentrating compartment near the outlet of the desalting compartment for obtaining the deionized water is reduced, silica and boron concentration in the deionized water obtained through the desalting compartment can be significantly reduced. For this purpose, a part of the deionized water obtained from the desalting compartment is supplied to the concentrating compartment in the flow direction opposite to that in the desalting compartment.

Also, a part of the deionized water is preferably introduced into the anolyte compartment. Since the deionized water does not contain Cl^- , generation of chlorine in the electrode compartment is prevented.

Shinmei et al. cited in the Action relates to a process for producing deionized water using electrodeionized water production equipment. The equipment includes ion depletion compartments 1, concentration compartments 2, an anode 12 and a cathode 13. When deionized water is to be produced, feed water flows into the ion depletion compartments 1 via feed water inflow lines 16, and concentrating water flows into the concentration compartments 2 via concentrating water inflow lines 18. As a result, the deionized water flows out of the ion depletion compartments 1 via deionized water outflow line 17. The concentrating water flows through the concentration compartments 2 in a direction opposite to the feed water flowing through the ion depletion compartments 1.

In claim 1 of the invention, a part of the deionized water is supplied into the concentrating compartment 15, and flows through the concentrating compartment 15 in a direction opposite to the raw water flowing through the desalting compartment 16. In Shinmei et al., the concentrating water flows through the concentration compartments 2 in a direction opposite to the feed water (raw water) flowing through the ion depletion compartments (desalting compartments) 1. However, in Shinmei et al., the concentrating water inflow lines 18 are independent of the deionized water outflow line 17, and there is no suggestion for supplying the

deionized water to the concentration compartments 2. Accordingly, a part of the deionized water does not flow into the concentration compartments 2 as claimed in claim 1 of the invention.

More specifically, in claim 1 of the invention, a part of the deionized water is supplied into the concentrating compartment 15 from a side adjacent to the outlet of the desalting compartment 16 and ejecting the part of the deionized water as the concentrated water from the concentrating compartment 15 from a side adjacent the inlet of the desalting compartment 16. In Shinmei et al., there is no such a feature. Accordingly, it is impossible in Shinmei et al. to obtain deionized water with very low silica and boron concentration.

Therefore, Shinmei et al. does not disclose or even suggest the features of claim 1 of the invention.

Denoncourt et al. cited in the Action relates to an apparatus for producing electrodeionized water. In the apparatus, liquid to be purified 26 passes through ion depleting compartments 28, and concentrated electrolyte liquid 40 passes through an anode compartment 32 and ion concentrating compartments 22. The liquid to be purified 26 passes through the ion depleting compartments 28 in alternate directions. A third electrolyte liquid stream 42 passes through a cathode compartment 34. It is also stated that concentrate 25 and electrode liquid 27 are sent to waste or recycled to their respective inlet.

In claim 1 of the invention, a part of the deionized water flowing out of the desalting compartment 16 is supplied into the concentrating compartment 15. In Denoncourt et al., the liquid passing through the ion depleting compartments 28 simply flows out as a product, and is not supplied to the concentrated electrolyte liquid 40. Namely, there is no line for supplying the purified liquid from the ion depleting compartments 28 to the ion concentrating compartments 22.

Further, in claim 1 of the invention, a part of the deionized water is supplied into the concentrating compartment from a side adjacent to the outlet of the desalting compartment and is ejected as concentrated water from the concentrating compartment from a side adjacent the inlet of the desalting compartment. In Denoncourt et al., the line 26 to the ion depleting compartments 28

and the line 40 to the ion concentrating compartments 22 are located at the same inlet sides, different from the invention.

Therefore, Denoncourt et al. does not disclose or even suggest the features of claim 1.

Another independent claim 10 of the present invention relates to an electrodeionization apparatus including the features substantially same as those in claim 1. Namely, the apparatus includes a concentrated water introducing device for introducing a part of the deionized water into the concentrating compartment from the inlet adjacent to the outlet of the desalting compartment. The concentrated water introducing device discharges concentrated water out of the concentrating compartment from the outlet adjacent to the inlet of the desalting compartment. The above and other structures are clearly recited in claim 10. Therefore, the cited references do not disclose nor suggest the features of claim 10 as well.

As explained above, the cited references do not disclose nor suggest the features of the invention. Even if the cited references are combined, the invention is not obvious from the cited references.

It is believed that the rejections are obviated, and the application is now in condition for allowance.

Reconsideration and allowance are earnestly solicited.

A check in the amount of \$36.00 is attached herewith for filing two additional dependent claims in excess of twenty.

Respectfully submitted,

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